



# International Space Station

## [ MISSION SUMMARY ]

**EXPEDITION 51** began in April 2017 and ends in June 2017. This expedition includes fluid physics, astrophysics and microbiology. One spacewalk is tentatively planned during Expedition 51.

### THE CREW:

**Soyuz MS-03 Launch: November 2016 • Landing: June 2017**



**Peggy Whitson (NASA) – Commander**

**Born:** Mount Ayr, Iowa  
**Interests:** weightlifting, biking, basketball and water skiing  
**Spaceflights:** STS-111, STS – 113, Exps. 5, 16, 50/51  
**Bio:** <http://go.nasa.gov/2eoOV8r>  
**Twitter:** @AstroPeggy



**Fyodor Yurchikhin (Roscosmos) – Flight Engineer**

**Born:** Batumi, Adjar ASSR, Georgian SSR  
**Interests:** collecting stamps and space logos, sports, history of cosmonautics and reading  
**Spaceflights:** STS-112, Exps. 15, 24/25, 36/37, 51/52  
**Bio:** <https://go.nasa.gov/2o9P09F>



**Thomas Pesquet (ESA) – Flight Engineer**

**Born:** Rouen, France  
**Interests:** basketball, jogging, swimming, squash, mountain biking, kite surfing, skiing, sailing and mountaineering  
**Spaceflights:** Exps. 50/51  
**Bio:** <http://go.nasa.gov/YSS3Jl>  
**Twitter:** @thom\_astro  
**Instagram:** @thom\_astro



**Jack Fischer (NASA) – Flight Engineer**

**Born:** Louisville, Colorado.  
**Interests:** spending time with my family, flying, camping, traveling and construction  
**Spaceflights:** Exps. 51/52  
**Bio:** <https://go.nasa.gov/2o9FY7o>  
**Twitter:** @Astro2Fish



**Oleg Novitskiy (Roscosmos) – Flight Engineer**

**Born:** Cherven, Minsk Region, Belorussia  
**Interests:** football, tourism, hunting, fishing, table tennis and reading  
**Spaceflights:** Exps. 33/34, 50/51  
**Bio:** <http://go.nasa.gov/2eoG0su>

### THE SCIENCE:

**What are some of the investigations the crew is operating?**

During Expedition 51, researchers will explore the microorganisms present aboard the space station, measure the charges of cosmic rays and study the way foods and medications respond to lyophilization in microgravity.

## ■ Extremophiles

Just as humans have maintained a constant presence aboard the space station since 2000, so have microorganisms. Because the facility isn't influenced by any other biological environment, only by entering and exiting crewmembers and supplies, the station is a special and unusual microbial habitat. Higher radiation, lower nutrient levels and a microgravity environment make the station an extreme biotope for microbes. Archaea and extremophilic bacteria have not been considered as a significant contributor to the microbiome that inhabits the ISS, although they constitute a significant part of the microbial communities that have been found in spacecraft assembly clean rooms.

This investigation will test for the Archaea and extremophile bacteria by sampling locations within the interior of the space station over a period of approximately six months and comparing them against samples from spacecraft clean rooms and visiting vehicles.

## ■ Eli Lilly Lypholization

Lypholization, or freeze-drying, is used in formulating pharmaceutical drugs, as well as preserving food and medications both on Earth and in space. The Eli-Lilly Lypholization investigation studies how this process occurs in a microgravity environment, and what improvements may be made to the current lypholization processes in the pharmaceutical industry, as well as other industries.

Results from this investigation will improve our understanding of how foods, drugs and other compounds may be preserved in space, aiding in the planning of future, long duration spaceflight.

## ■ Cosmic Ray Energetics and Mass

Cosmic rays reach Earth from far outside the solar system with energies well beyond what man-made accelerators can achieve. The Cosmic Ray Energetics and Mass (CREAM) instrument, attached to the Japanese Experiment Module Exposed Facility, measures the charges of cosmic rays ranging from hydrogen to iron nuclei. The data collected from the CREAM instrument will be used to address fundamental science questions such as:

- Do supernovae supply the bulk of cosmic rays?
- What is the history of cosmic rays in the galaxy?
- Can the energy spectra of cosmic rays result from a single mechanism?

Tested in several long duration balloon flights, the CREAM instrument holds the longest known exposure record for a single balloon-borne experiment at approximately 161 days of exposure. CREAM's three year mission will help the scientific community to build a stronger understanding of the fundamental structure of the universe.

## THE MISSION PATCH:

From as early as the 11th century, coats of arms have been used as emblems representing groups as small as families to as large as countries. The Expedition 51 patch is designed as a modernized international coat of arms, blending the traditional shield shape with our modernized symbol of achievement, the International Space Station. The background represents our home world and its inhabitants on the left, and outer space to the right. The bi-color International Space Station is the bridge between the two, symbolizing the benefits on Earth of space research, and at the same time our mission to explore deeper into space, on a path to further discovery and knowledge.



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